

The NASA Ames Airborne Tracking Sunphotometer, AATS-14, in INTEX-B/MILAGRO: Instrument Description and Science Goals

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In INTEX-B/MILAGRO the NASA Ames Airborne Tracking Sunphotometer, AATS-14 (see image below), will fly aboard the Jetstream 31 (J31) during a three-week period in March, 2006. AATS-14 measures direct solar beam transmission at 14 wavelengths between 354 and 2139 nm in narrow channels with bandwidths between 2 and 5.6 nm for the wavelengths less than 1640 nm and 17.3 nm for the 2139 nm channel. Additional instrument details are available at http://geo.arc.nasa.gov/sgg/AATS-website/AATS6_AATS14/AATS6_AATS14.html. The trans-



mission measurements at all channels except 940 nm are used to retrieve spectra of aerosol optical depth (AOD). In addition, the transmission at 940 nm and surrounding channels is used to derive columnar water vapor (CWV) [Schmid *et al.*, 2001]. Methods for AATS-14 data reduction, calibration, and error analysis have been described extensively, for example, by Russell *et al.*, [1993] and Schmid *et al.* [2001]. For INTEX-B/MILAGRO, AATS-14 will be calibrated before and after the experiment at Mauna Loa Observatory (MLO) using the Langley plot technique.

AATS-14 measurements of spectral AOD and CWV obtained during aircraft vertical profiles can be differentiated to determine corresponding vertical profiles of spectral aerosol extinction and water vapor density. Such measurements have been used extensively in the characterization of the horizontal and vertical distribution of aerosol optical properties and in the validation of satellite aerosol sensors. For example, in the Aerosol Characterization Experiment-Asia (ACE-Asia), AATS measurements were used for closure (consistency) studies with in situ aerosol samplers aboard the NCAR C-130 and the CIRPAS Twin-Otter aircraft, and with ground-based lidar systems. In ACE-Asia, CLAMS (Chesapeake Lighthouse & Aircraft Measurements for Satellites, 2001) and the Extended-MODIS- λ Validation Experiment (EVE, 2004), AATS results have been used in the validation of satellite sensors aboard various EOS platforms, providing important aerosol information used in the improvement of retrieval algorithms for the MISR and MODIS sensors among others. Similar research using AATS data collected in INTEX-A is currently being pursued.

In INTEX-B/MILAGRO, specific goals of AATS-14 aboard the J31 are to:

- characterize horizontal & vertical distributions of aerosol optical depth (AOD) and extinction spectra (354-2138 nm), water vapor columns and density,
- validate A-Train & Terra products (CALIPSO, OMI, MODIS, POLDER, TES, AIRS, MISR),

- test closure with in situ and remote sensors, including airborne lidar, on other platforms,
- test chemical transport models using AOD & extinction profiles,
- assess regional aerosol radiative effects.

In addition to the AATS-specific goals above, we plan to combine AATS data with measurements collected by the other three radiation sensors aboard the J31, i.e., a pair of Solar Spectral Flux Radiometers (SSFR), the Cloud Absorption Radiometer (CAR) and the Research Scanning Polarimeter (RSP). Specifically, by combining AATS and SSFR data we intend to derive aerosol radiative forcing from simultaneously measured radiative flux and AOD gradients, to study the effect of AOD above cloud on cloud property retrievals by SSFR and satellites, to study the influence of aerosols on cloud radiative forcing, and to derive spectra of aerosol absorbing fraction (1-SSA) in thick polluted layers. In addition, we plan to support the RSP retrievals of spectral optical depth, aerosol microphysics and surface polarized BRDF (Bi-directional Reflectance Distribution Function). Finally, AATS and CAR data will be combined to retrieve surface BRDF and aerosol optical properties.

For information and details of AATS measurements, including the two previous AATS-14 deployments on the J31 in INTEX-A and the ARM ALIVE program, please visit

<http://geo.arc.nasa.gov/sgg/AATS-website/>.

References

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